VII Semester Syllabi – Civil Engineering

SEMESTER – VII

Sr. No.	Subject Code	Courses	L	T	P	Credit
1		EL-05	3	0	0	3
2		EL-06	3	0	0	3
3		OE-03	3	0	0	3
4	CE3PC01	Project Work 1	0	0	8	4
5	CE3PC03	Industrial Training	0	2	0	2
		Total	**9**	**2**	**8**	**15**
		Total Contact Hours	**19**			

Programme Elective (EL)								
S. No.	Course Code	Course name	L	T	P	Credit	Preferred Semester	Specialization
1	CE3ES02	Advanced Design of RCC Structures	3	0	0	3	VII	**Structural Engineering**
2	CE3ES03	Advanced Design of Steel Structures	3	0	0	3	VII	
3	CE3ES04	Bridge Engineering	3	0	0	3	VII	
4	CE3ES06	Earthquake Resistant Design	3	0	0	3	VII	
5	CE3EE01	Air & Noise Pollution	3	0	0	3	VII	**Environmental Engineering**
6	CE3EE06	Industrial Waste Water Management	3	0	0	3	VII	
7	CE3EE07	Planning for Sustainable Development	3	0	0	3	VII	
8	CE3EE08	Solid Waste Management	3	0	0	3	VII	
9	CE3EC01	Advanced Construction Equipment & Materials	3	0	0	3	VII	**Construction Management**
10	CE3EC02	Construction Laws and Regulation	3	0	0	3	VII	
11	CE3EC06	Construction Quality Control & Management	3	0	0	3	VII	
12	CE3EC08	Energy Conservation Techniques in Building Construction	3	0	0	3	VII	

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES02	Advanced Design of RCC Structures	3	0	0	3

UNIT I

Building Frames- Introduction to building frames, Various load combinations, Substitute frame method of frame analysis, Portal frame method, Cantilever method, and design of frames, Design of shear walls

UNIT II

Earth Retaining Structures: Cantilever and counter fort type retaining walls.

UNIT III

Design of Circular Water Tanks-Water tanks: Design criteria, material specifications and Permissible stresses for water retaining structures, Design of circular water tanks with fixed & flexible base situated on the ground/underground

Design of Rectangular Water Tanks-Design of square /rectangular tanks situated on the ground/underground using approximate method and IS-code method.

Overhead tanks: Circular and Intze tanks.

UNIT IV

Silos and Bunkers: Introduction, difference between Bunker and Silo, design of bunkers (Single Unit), design of silos by Airy's theory and Janssen's theory.

UNIT V

T-beam & Slab bridges-for highway loading (IRC Loads). Principles of prestressed concrete design, materials, methods of prestressing, losses, Analysis of beam sections at transfer and service loads, Design of simple members and determinate structures, Introduction to working and limit state design.

Text Books:

1. J. Krishna and O.P. Jain, Plain and Reinforced Concrete,Vol. I and II, Nemchand Bros. Roorkee.
2. Krishnaraju, Advanced reinforcement concrete design, CBS Publisher
3. Jain, A.K., "Reinforced Concrete Limit State Design", 7th Ed., Nemchand & Bros., Roorkee.

Reference Book:

1. IS 456: 2000. Code of Practice for Plain and Reinforced concrete.
2. Pillai, S.U. and Menon, D., "Reinforced Concrete Design", Tata McGraw-Hill.
3. Sinha &Roy, Reinforced concrete design, McGraw Hill Education.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES03	Advanced Design of Steel Structures	3	0	0	3

UNIT I

Plate girder bridges (Riveted and welded)

UNIT II

Trussed girder bridges for railway and highways (IRC & IRS Loading). Types of bearing for bridges, sliding, rocker and pin, Roller, Elastomeric, Curve, Pot & Disk. Design of Rocker and Pin bearing.

UNIT III

Details of components of Industry building, and design of industry building with all components like purlins, Rafter, Roof bracing, Roof Truss, Column, Base plate anchore end connection etc. Apex Hanger, Tubelar truss.

UNIT IV

Chimneys: Guyed and self supporting steel stacks.

UNIT V

Bunkers, Silos & types of Towers and design of lattice towers.

Text Books:

1. S. Ramammutham, Design of steel structures, Dhanpat Rai Publication.
2. B.C. Punmia, Design of steel structures, Laxmi Publication.
3. Ramchandra, Design of steel structures Vol. I & II, Scientific Publication, Jodhpur.

Reference Books:

1. L.S. Negi, Design of steel structures, Mc Graw Hill Education.
2. N. Subramanian, Design of steel structures, Oxford University
3. Arya & Ajmani, Steel Structure, Nemchand & Brothers

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES04	Bridge Engineering	3	0	0	3

UNIT I

Introduction, Type of Bridges, Economic spans, Aesthetics, requirements in bridge design, selection of suitable types of bridge, Bridge codes

UNIT II

Design loads and their distribution – IRC Load, Railway loading systems, Analysis of deck slab, Load distribution in longitudinal beams of a bridge, Introduction to pre-stressed methods of design.

UNIT III

Design of superstructure- Design of balanced cantilever concrete bridge, Introduction to design of RC Arch bridge, Box girder bridge, Bridge vibration.

UNIT IV

Design of substructure – Different types of foundation, Their choice and method of construction, Design of well foundation, Design of Piers and abutments, types of bearings and design of pot bearing.

UNIT V

Construction Method – Erection of bridge superstructures, Cantilever bridge construction methods, grillage analysis, Cable Stayed and suspension bridge analysis.

Text Books:

1. Raina V. K., Concrete Bridge Practices, TMH
2. Jagadeesh T. R. and Jayaram, M. A., Design of Bridge Structure, PHI Learning
3. Bindra S. P., Principles and Practice of Bridge Engineering. Dhanpat Rai Publication

Reference Books:

1. Victor D. J., Essentials of Bridge Engineering, Oxford & IBH.
2. Raju N. K., Design of Bridges, Oxford & IBH.
3. Ponnuswamy S, Bridge Engineering, TMH.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3ES06	Earthquake Resistant Design	3	0	0	3

UNIT I

Seismic-Resistant Building Architecture: Introduction; Lateral load resisting systems-moment resisting frame, building with shear wall or bearing wall system, building with dual system; Building configuration –Problems and solutions: Building characteristics – Mode shape and fundamental period, building frequency and ground period, damping, ductility, seismic weight, hyperstaticity / redundancy, non-structural elements, foundation soil/ liquefaction. Foundations; Quality of construction and materials–quality of concrete, construction joints, general detailing requirements

UNIT II

Design forces for Buildings: Introduction; Equivalent static method; Mode superposition technique; Dynamic inelastic-time history analysis; Advantages and disadvantages of these methods; Determination of lateral forces as per IS 1893(Part1) – Equivalent static method. Model analysis using response Spectrum

UNIT III

Ductility Considerations in Earthquake Resistant Design of RCC Buildings: Introduction; Impact of ductility; Requirements for ductility; Assessment of ductility–Member/element ductility, Structural ductility; Factor affecting ductility; Ductility factors; Ductility considerations as per IS13920

UNIT – IV

Earthquake Resistant Design of a long Two-Storey, Two- bay RCC Building: - Determination of lateral forces on an intermediate plane frame using Equivalent static method and Model analysis using response spectrum; Analysis of the intermediate frame for various load combinations as per IS1893 (Part 1); Identification of design forces and moments in the members; Design and detailing of typical flexural member ,typical column, footing and detailing of a exterior joint as per IS13920.

UNIT-V

Base isolation of structures- Introduction; Considerations for seismic isolation; Basic elements of seismic isolation; seismic-isolation design principle; Feasibility of seismic isolation; Seismic-isolation configurations

Text Books:

1. Pankaj Agarwal and Manish Shrikhande, Earthquake resistant design of structures Prentice-Hall of India.
2. T. Paulay and M.J.N. Priestley, Seismic design of reinforced concrete and masonry buildings John Wiley & Sons.

Reference Books:

1. S. K. Duggal; Earthquake Resistance Design of Structures; Oxford University Press, New Delhi
2. F. Nacim, The seismic design handbook, Kluwer Academic publishers.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE01	Air and Noise Pollution	3	0	0	3

UNIT I INTRODUCTION TO AIR POLLUTION

Air Pollution, Definition, Air Pollution and Global Climate, Units of measurement of pollutants, Air quality criteria, emission standards, National ambient air quality standards, Air pollution episodes.

UNIT II SOURCES, CLASSIFICATION AND EFFECTS

Sources and classification of air pollutants, Manmade, Natural sources, Type of air pollutants, Pollution due to automobiles, Analysis of air pollutants. Air pollution and its effects on human beings, plants and animals, Economic effect of air pollution.

UNIT III AIR QUALITY SAMPLING AND MONITORING

Ambient air sampling, Stack sampling, instrumentation and methods of analysis of gaseous pollutants, Meteorology, legislation for control of air pollution and automobile pollution.

UNIT IV AIR POLLUTION CONTROL MEASURES

Control equipment, Particulate control methods, Baghouse filter, Settling chamber, cyclone separator, inertial devices, Electrostatic precipitator, scrubbers, Control of gaseous emissions, Absorption, Absorption equipment's, adsorption and combustion devices.

UNIT V NOISE POLLUTION AND ITS CONTROL

Sources of noise, Units and Measurements of Noise, Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise, Noise measuring equipment, Effects of noise pollution, Prevention and control of noise pollution.

Text Books:

1. S.K. Garg, Khanna publishers, Sewage Disposal and Air Pollution Engineering.
2. S.M. Khopkar, Environmental pollution analysis, New Age International Publisher.
3. Balram Pani , Environmental engineering, New Age International Publisher.

Reference Books:

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited.
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt. Ltd, New Delhi.
3. G.K. Nagi, M.K. Dhillon, G.S. Dhaliwal, Commonwealth Publishers, Noise Pollution.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE06	Industrial Waste Water Management	3	0	0	3

UNIT I

INTRODUCTION: Industrial scenario in India– Industrial activity and Environment, Uses of Water by industry ,Sources and types of industrial wastewater ,Nature and Origin of Pollutants ,Industrial wastewater and environmental impacts , Industrial waste survey , Industrial wastewater monitoring and sampling ,generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

UNIT II

INDUSTRIAL POLLUTION PREVENTION Prevention vis a vis Control of Industrial Pollution, Benefits and Barriers, Waste management Hierarchy, Source reduction techniques, Periodic Waste Minimisation Assessments , Evaluation of Pollution Prevention Options , Cost benefit analysis , Pay-back period , Implementing & Promoting Pollution Prevention Programs in Industries.

UNIT III

INDUSTRIAL WASTEWATER TREATMENT Flow and Load Equalisation, Solids Separation, Removal of Fats, Oil & Grease, Neutralization, Removal of Inorganic Constituents, Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration.

UNIT IV

WASTEWATER REUSE AND RESIDUAL MANAGEMENT Individual and common effluent treatment plants, Zero effluent discharge systems, Wastewater quality requirements for its reuse, Residuals of industrial wastewater treatment

UNIT V

CASE STUDIES Industrial manufacturing process description, Wastewater characteristics, Source reduction options and waste treatment flow sheet for Textiles, Food Processing, fertilizers, Thermal Power Plants and Industrial Estates.

Text Books:

1. Nelson Leonard Nemerow, "industrial waste Treatment", Elsevier,
2. Wesley Eckenfelder W., "Industrial Water Pollution Control", Second Edition, Mc Graw Hill,
3. J. Arceivala, Shyam. R. Asolekar, Waste water Treatment for pollution control and reuse by Soli Tata Mcgraw Hill.

Reference Book:

1. "Industrial wastewater management, treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition.
2. Lawrance K.Wang, Yung Tse Hung, Howard H.Lo and Constantine Yapijakis "handlook of Industrial and Hazardous waste Treatment", Second Edition.
3. Metcalf & Eddy/ AECOM, "water reuse Issues, Technologies and Applications", The Mc Graw- Hill companies.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE07	Planning for sustainable Development	3	0	0	3

UNIT I

Sustainable Development :- Concept of sustainable development, Environmental degradation and poverty sustainable development: its main principles, the evolution of ideas about sustainability, strategies for promoting sustainable development, resistances to the concept, and alternative approaches. some important current issue and areas of debate in relation to suatainable development.

UNIT II

Innovation for sustainable development :- Sources of innovation, types of innovations patterns and models of innovation, Environmental management principle of environmental management and innovation strategies, ecosystem and environment health.

UNIT III

Societal Transformation - Concept of community participation, need for community participation in sustainable development, case studies of community participation in health and development, Institutional theory, concept of urban development plan, impact on overall development of the cities.

UNIT IV

Governance for sustainable development Relation between governance and human development, globalisation, civil society, Policy responses to environmental degradation, UNDP policy for governance programming

UNIT V

Capacity development for innovation - Technological speciation, management innovation, managing innovation in open and close innovation system. managing innovation & championing innovation, Research methods- foundation of research, meaning, objectives, classification of research.

Text Books:

1. Hjorth P. and A. Bagheri Navigating toward sustainable Development: A System Dyanamics Appoarch, Future 38: 74-92.
2. Douthwaite, B. Enabling Innovation. A practical guide to understanding and fostering innovation, London, Zed Books.
3. Mog. J.M. 'struggling with sustainability- A comparative frame work for Evaluating Sustainable Development programs. Word Development 32(12): 2139-2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF-68kb).

Reference Books:

1. M.H. Fulekar, RK kale, Bhawana Pathak Editors Publishing.
2. Peter Rogers, Kazi F. Jalal,John A. Boyd. Publisher Earthscan Publications Ltd.
3. John Blewitt, Understanding sustainable Development.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EE08	Solid Waste Management	3	0	0	3

UNIT I Introduction:
Solid Waste: Definitions, Characteristics, and Perspectives; Types of solid wastes, , solid waste management: an overview, scope and necessity of solid waste management. Sources.

UNIT II Solid Waste Properties and Handling:
Sources, compositions, physical, chemical and biological properties of solid wastes, Onsite handling, storage including segregation; Collection, Recycling, Transfer and transport.

UNIT III Solid Waste Processing:
Waste processing technologies, Biological, chemical and thermal technologies – Composting, Anaerobic digestion, Incineration and pyrolysis.

UNIT IV Solid Waste Energy Recovery:
Energy Recovery: materials-recovery systems; recovery of biological conversion products; recovery of thermal conversion products; recovery of energy from conversion products.

UNIT V Solid Waste Disposal and Rules:
Disposal of solid waste including sanitary landfill, planning, siting, gas generation in landfill, closure of landfills, Rules and acts, issues of public participation in solid waste.

Text Books:

1. Bhatia, S. Solid and Hazardous Waste Management, Atlantic Publishers & Distributors.
2. A.L. Bhide and B. B.Sundarasan, Solid Waste Management in Developing Countries,
3. Indian National Scientific Documentation Centre.
4. Frank Kreith, Handbook of solid waste management, McGraw-Hill Education.

Reference books:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc.
3. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EC01	Advance Construction Equipment and Materials	3	0	0	3

UNIT I Modern Construction Materials: Polymers in civil engineering-structural plastics and composites- polymer membranes coatings-adhesives, non - weathering materials, flooring and facade materials- glazed brick, composite fiber, water jet cut stainless steel, mill slab steel and heat treatment in steels.

UNIT II Smart Materials: concept and types, sensing technology-types of sensors –physical measurement using piezoelectric strain measurement, piezoelectric and electro strictive material - magneto structure material, shape memory alloys, electro rheological fluids, uses and properties of materials used in Retrofitting- FRP, CFRP and GFRP, epoxy resin.

UNIT III Construction Equipment's Excavation by Blasting-chiseling and other excavation equipment's, blasting theory, rock excavation, basic mechanics of breaking, Aggregate production equipment-crusher-types and size, Pile and Pile driving equipment's and its methods.

UNIT IV Construction Equipment's Dozers, Scrapers, and Excavators: Introduction, Performance Characteristics of Dozers, Pushing Material, Land Clearing, Scraper types, operation, Performance Charts, Production cycle, Hydraulic Excavators, Shovels, and Hoes.

UNIT V Construction methods: Precast flat panel system, 3d volumetric construction, tunnel boring methods, slip form work, precast foundations fabrication of pre-cast work, reinforcing steel: types, bending, placing, splicing and spacing.

Text Books:

1. "Construction Equipment and Management ", Sharma S.C., Khanna Publishers New Delhi
2. Dewatering: New Methods and Applications, John Wiley and SonsMohan, R. and Jaisingh. M.P., Advances in Building Materials and Construction, CBRI Roorkee.
3. Advanced Construction Techniques, Irvine, J., California Rocketry.

Reference Books:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, "Construction Planning Equipment and Methods ", 5th Edition, McGraw Hill, Singapore.
2. Practical foundation engineering hand book, Brown, R., McGraw Hill Publications.
3. National Building Code of India, Part-IV and VII – 2006.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EC02	Construction Laws and Regulations	3	0	0	3

UNIT I

Construction Contracts – Elements of Contracts, Type of Contract, Design of Contract Documents, International Contract Document Standard Contract Document.

UNIT II

Tender- Prequalification, Bidding, Accepting, Evaluation of Tender, Potential Contractual Problem, World Bank Procedures.

UNIT III

Arbitration, Action, Law, Appointment of Arbitrator Power Rule of Evidence, Claims And Disputes; Arbitration Case Studies;

UNIT IV

Legal Requirement- Insurance, Bonding, Sale, Purchase, Land Revenue Codes, Tax Laws, Income Tax Laws, Sales Tax, Custom Duties, Influence on Construction Cost.

UNIT V

Local Government Laws For Approval Statutory Regulations (Development Control Rules For Local Body For A Class, B Class And C Class), Town Planning Act, Labor Regulation, Social Security, Welfare Legislation, Laws Relating To Wages, Bonus And Industrial Disputes, Labor Administration, Insurance And Safety Regulations, Workmen's Compensation Act, Other Labor Laws.

Text Books:

1. Dr. V. K. Raina, "Construction & Contract Management Practice", Shroff publishers and distributors pvt. Ltd. New Delhi.
2. B. N. Dutta, "Estimating and costing in civil engineering", 26th revised edition, UBS Publisher and distributor's pvt ltd, New Delhi.
3. K.A.N. Taloasai, "Practical Aspect of Tendering and Contractual Operations of Civil Work", J. M. Jaina & Brothers, Delhi

Reference Books:

1. Justice P. S. Narayana & S. R. C. Nayar, "Law of contracts with special reference to Tenders and Construction Agreement"
2. FIDIC- Construction, Insurance and Law- A discussion Document.
3. R. A. Sharma, "Handbook of Arbitration in Construction Contracts", Om Law Book House, Delhi.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EC06	Construction Quality Control & Management	3	0	0	3

UNIT I

Construction Quality Management: Concept, Definition and evolution, inspection, Quality control and quality Assurance, Total quality Management (TQM), Cost of Quality.

UNIT II

Practical Aspect of Quality Matter: Quality system in Architectural and structural Design, Drawing and Quality Audit, Aspects of Quality Management in Construction.

UNIT III

Achieving TQM in Construction Projects: Major determinants of Quality control, Semantics of Quality, Quality Assurance Program (QAP), Templates for quality assurance, Quality dimensions for Earthwork, Quality dimensions for RCC work, Quality Audit in Construction works as per ISO 9000, TQM in Building design.

UNIT IV

Inspection of Quality Control: Inspection benefits and item wise check list for Quality control, TQM in Building maintenance, Quality checking as per PWD /CPWD specifications and BIS codes

UNIT V

Quality Assurance: Contractor's quality assurance and Quality control plan, Laboratory for Quality control of construction works, Quality effect using modern materials and construction machinery, Quality control of service lines, water supply, drainage, sewerage, sanitary installations, Quality assurance circulars issued by CPWD.

Text books:

1. S.C. Basu Roy, "Modern concept of Total Quality control and management for construction", A Nabhi Publication, New Delhi.
2. K. A, N, Talpasai, "Quality Dimensions in Civil construction", J. M. Jain and brothers, Mori gate, Delhi.
3. Kumar Neeraj Jha, "Construction Project Management, Theory and Practice", Pearson Education, New Delhi.

Reference books:

1. Prasanna Chandra, Projects, Planning, analysis, selection, financing, implementation and review, 7th edition, McGraw Hill Education India Pvt. Ltd., New Delhi.
2. P.S. Gahlot and Deep Gahlot, "Quality Management of Cement Concrete Construction", CBS Publishers and Distributors, New Delhi.
3. Abdul Razzak Rumane "Quality Management in Construction Projects",2nd edition.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CE3EC08	Energy Conservation Technique in Construction of Buildings.	3	0	0	3

UNIT I

Fundamental of Energy: Energy production systems: Heating, ventilating, air conditioning, solar energy and conservation- energy economic analysis, domestic energy consumption, savings, primary energy use in buildings- residential, commercial, institutional and public buildings. Solar passive heating and cooling: elements of heating and cooling load, load reduction approaches, thermal mass. Passive heating: direct and indirect solar passive heating system: solarium, trombe wall, trans-wall.

UNIT II

Energy and Resource Conservation: Concepts of green building: leed, griha, sustainable sites, water energy, materials, and indoor environmental issues for green buildings. Concept of net zero energy building. Biomass resource: characteristics, technologies for using biomass, comparison of direct combustion with other technologies. Industrial use of biomass. Biogas.

UNIT III

Ductility Considerations in Earthquake Resistant Design of RCC Buildings: Introduction; Impact of ductility, Requirements for ductility, Assessment of ductility–Member/element ductility, Structural ductility, Factor affecting ductility, Ductility factors, Ductility considerations as per IS13920

UNIT IV

Energy in Building Design: Active HVAC systems, preliminary investigation, goals and policies. Energy audit: types of energy audit, analysis of results, energy flow diagram. Solar PV power plants: array design, inverter types and characteristics. Power conditioning system: working algorithms, performance analysis, design of standalone, commissioning of PV plants. Wind and hydro energy system: basics, advantage and disadvantages, site selection, principles. Components of a wind energy converter: rotor blades, gear boxes, synchronous or asynchronous generators, towers, turbine selection.

UNIT V

Energy management: Introduction to energy codes and policies: energy conservation act, electricity act, solar policy, hydro policy, biomass policy. Energy conservation building code – requirement of code, applicability, Planning and management of environmental system: optimization techniques, Energy consumption in industries: energy and materials flow assessment, specific energy consumption, industry benchmarks for energy consumption.

Text Books:

1. KC Kandelwal, SS Mahdi, biogas technology – A practice handbook, Tata McGraw hill.
2. S.P.sukhatme, solar energy : principles of thermal collection and storage, tata Mc graw hill.
3. LC Witte, PS Schmidt, DR Brown, industrial energy management and utilization, hemisphere publication, Washington.

Reference Books:

1. Moore.f, "Environmental control system" Mc Graw Hill.
2. Brown, GZ Sun, "Wind and light: architectural design strategies", john wiley.
3. Cook.j.award- " Winning passive solar design", Mc- graw hill.

Syllabs of Open Electives

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00038	Remote Sensing and GIS	3	0	0	3

UNIT I

Introduction to GPS: - The History of GPS, The Evolution of GPS, GPS working principle, Trilateration, Other Global Navigation Satellite Systems, GLONASS, GALILEO, GPS Satellite constellation and Signals GPS system segments, Space segment, Control segment, User segment.

Coordinate Systems: Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geo centric coordinate systems, ECEF coordinates, Datum, world geodetic 1984 (WGS 84), Conversion between Cartesian and geodetic coordinate frame, approximation of earth.

UNIT II

Remote Sensing Overview: - Definition, Remote Sensing Concept, Components in Remote Sensing, Types of Remote Sensing, Energy sources and radiation principles, Energy interaction in atmosphere, Energy interaction with earth surface features, spectral response patterns, Multistage Remote Sensing Data Collection, Types and Uses of Satellites, Remote sensing satellite orbits, Preprocessing of remotely sensed imagery.

UNIT III

Characteristics of photographic images and colour, tone, texture, photo-image interpretation keys. Digital image analysis techniques: False color Composite (FCC), digital image classification techniques and extraction of thematic information, Application of remote sensing in terrain investigation and advantages over conventional mapping techniques.

UNIT IV

Basics of GIS:- Introduction to GIS: Definition, GIS applications, Components of a GIS, Geospatial Data, spatial data and attribute data, GIS operations, Map projections, Types of map projection, projected coordinate system, UTM grid system, UPS grid system, SPC system.

UNIT V

Data Models in GIS:- Geo-relational Vector Data Model: Definition of Geo-relational Vector Data Model, Representation of Simple features, Topology, Nontopological vector data, Data models for composite features.

Raster Data Model: Elements of raster data model, types of raster data, Raster data structure, Data compression, Data conversion, Integration of raster and vector data

Text Books:

1. Lillesand T.M. and Kiefer R. W., Remote Sensing and image interpretation- Willey.
2. G. S. Rao, "Global Navigation Satellite Systems with Essentials of Satellite communications," McGraw Hill, New Delhi
3. Kang-Tsung Chang, Introduction to Geographic Information Systems- McGraw Hill International Edition.

Reference Books:

1. J. B. Campbell, Introduction to remote sensing, John Willey.
2. J. R., Jensen, Introductory digital image processing, Prentice Hall.
3. P.A. Burrough, Principles of Geographic Information Systems for land Resources Assessment, Wiley.